Leon E. Stimson

UNITED STATES DEPARTMENT OF AGRICULTURE

BELTSVILLE RESEARCH CENTER

BELTSVILLE MARYLAND

INFORMATION

USDA
BRC

Area

- BUILDING DIRECTORY -

0.1 - HORTICULTURE ADMINISTRATION
0.2 - GRANARY

1.1 - DAIRY ADMINISTRATION
1.2 - ANIMAL DISEASE ADMINISTRATION
1.3 - INFORMATION

2.1 - NUTRITION LAB. & ADMIN.
2.2 - MEATS LABORATORY
2.3 - BEEF CATTLE BARN
2.4 - SHEEP BARN
2.5 - DISPOSAL PLANT
2.6 - POULTRY LABORATORY

3.1 - CENTER LAB. (B.R.C. MANAGEMENT & OPERATIONS - HOME ECONOMICS AND B.R.C. LIBRARY)
3.2 - SOUTH LAB. (DIV. OF INSECT. E.& P.Q.- INSECT. DIV. A.M.S. - GRAIN & SEED A.M.S.)
3.3 - NORTH LAB. (FERTILIZER INVEST. B.P.I.)
3.4 - CARTOGRAPHIC DIV. & SERVICE BLDG.
3.5 - FILM STORAGE VAULT
3.6 - LOG LODGE (CAFETERIA)
3.7 - ZOOLOGY ADMINISTRATION
3.8 - CHEMISTRY & ENGINEERING LAB.

4.1 - B.R.C. MECHANICAL SHOPS
4.2 - HORSE BARN
4.3 - GOAT BARN
4.4 - INSECTICIDE LABORATORY
4.5 - C.C.C. CENTRAL REPAIR SHOPS
4.6 - RADIO SECTION - DEPT. OF COMMERCE
4.7 - ENTOMOLOGY LAB. - BEE CULTURE AND INSECT CONTROL
4.8 - N.Y.A. ADMINISTRATION

5.1 - SWINE FARROWING HOUSE
5.2 - DUAL PURPOSE CATTLE BARN
5.3 - HILLCULTURE S.C.S.
5.4 - NURSERY S.C.S.

6.1 - FOREST SERVICE LABORATORY

U. S. DEPARTMENT OF AGRICULTURE
BELTSVILLE RESEARCH CENTER
BELTSVILLE MARYLAND

SCALE IN MILES

- LEGEND -

- PROPERTY LINE
- BOUNDARY BETWEEN UNITS
- SURFACED ROADS
- UNSURFACED ROADS
- PROPOSED ROADS
- PROPERTY NOT UNDER JURISDICTION OF B.R.C.
- 3 AREA NUMBERS
- 3.2 BUILDING NUMBERS
- † CEMETERY
- CHURCH

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UNITED STATES DEPARTMENT OF AGRICULTURE
Washington, D. C.

BELTSVILLE, MD., RESEARCH CENTER

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The research center of the U. S. Department of Agriculture at Beltsville, Md., 13 miles northeast of Washington, D. C., is one of the world's largest and most comprehensive institutions devoted to the scientific solution of farm problems. Other big American industries -- steel and automobiles for example -- operate research centers for the benefit of all their members. Being much less well organized, agriculture needs Government aid for its research.

Every State in the Union has an agricultural experiment station. These stations, however, deal primarily with local problems. For basic information, vital for the solution of these local problems, they must look to an organization that can approach each problem objectively and study it from every angle for as long as necessary, with no need to consider the purely local application of results. Such is the type of organization at Beltsville.

Beginning in 1910 with 475 acres, the Research Center now spreads over 12,461 acres, 2,238 of which form the Patuxent Research Refuge of the Fish and Wild Life Service, U. S. Department of the Interior. Originally only one unit of the Department of Agriculture -- the Bureau of Animal Industry -- used the Research Center. Eight other units now have space there -- the Bureau of Plant Industry, the Bureau of Dairy Industry, the Bureau of Entomology and Plant Quarantine, the Forest Service, the Soil Conservation Service, the Agricultural Marketing Service, the Bureau of Home Economics, and the Agricultural Adjustment Administration.

The Research Center employs nearly 1,000 people and keeps nearly 3,000 experimental farm animals, more than 15,600 experimental fowls, and about 5,500 small animals -- rabbits, guinea pigs, rats, and white mice -- for laboratory tests. The scientists stationed at Beltsville include agronomists, animal husbandmen, apiculturists, bacteriologists, biochemists, biologists, botanists, chemists, entomologists, geneticists, grain technologists, home economists, horticulturists, marketing specialists, parasitologists, pathologists, physicists, physiologists, pomologists, silviculturists, soil conservationists, statisticians, veterinarians, and zoologists. The experimental dairy herd is mostly Holstein-Friesian, with some Jersey, some Guernsey, and some Red Danish cattle. The other experimental animals comprise beef and dual-purpose cattle, horses, sheep (including some Karakul), goats, swine, and dogs. The experimental flocks consist of chickens, turkeys, and pigeons.

Twenty-eight laboratory buildings, each constructed and equipped to meet the needs of a special kind of research, provide office and laboratory space for the Center's administrative officers, the scientists, and their

aides. Thirty-one greenhouses have been built for the experimental plants and some of the experimental insects. There is an apiary for the bees. Eighty-four barns and 500 other structures -- small animal houses, pens, and poultry houses -- shelter the experimental animals and fowls. In addition, the Center has an abattoir, a granary, mechanical shops, and a central sewage-disposal plant. These buildings, with roads and service facilities, cost about $9,000,000. The land around the buildings is divided into experimental pastures, ranges, orchards, and cultivated-crop fields, timber stands, and soil-treatment plots.

The annual cost of research at the Center is about $1,900,000. This outgo is offset to the extent of $55,000 to $60,000 a year by returns from the sale of surplus dairy products, meat, poultry and eggs, and fruits and vegetables. None of this produce is raised with any idea of marketing it. It is purely left-over research material. Unless sold or given away it would be a total waste.

BREED BETTER PLANTS AND ANIMALS

The first research at Beltsville was designed to breed better farm crops -- both plants and animals. This research has continued on a constantly widening front. It is the natural outgrowth of breeding for better plants and animals that has been going on for centuries.

"Since life began," says the 1936 Yearbook of Agriculture, "nature has been 'breeding' plants and animals. She crossed them. She inbred them. She subjected them to mysterious forces powerful enough to bring about changes in the germ stuff that determines their characteristics. She put them through hardships that only the fit could survive. Out of these processes, carried on over millions of years, myriads of forms of living things have been developed.

"For a long time after man came on the scene, he took what nature gave him. But eventually he began to gather seeds from the fields and plant them and to capture young animals and tame them. As he gained experience he became dissatisfied with what he got from nature and began making improvements. He picked out the plants that seemed the best and increased them, gradually discarding the others. He selected the best animals for mating. It was a slow, crude business, but there was plenty of time. Long before the dawn of history these generations of picking and choosing had resulted in most of the major types of agricultural plants and domestic animals we have today."

The early scientists started, slowly and painstakingly, to work out more exact methods for improving plants and animals. It was not until 1900, however, that genetics -- the science of the quality of life as it passes from one generation to the other -- took its place beside physics, chemistry, and the other well-established sciences. The scientists at Beltsville are applying this new science to their breeding problems.

CREATE NEW FRUITS AND VEGETABLES

Plant breeders seek new varieties of fruits, vegetables, and nuts that will meet the world's rapidly changing requirements. One important requirement is resistance to the diseases that from time to time threaten to wipe out a whole industry in some part of the country. Others are for properties that make for better eating quality and for good keeping and good shipping. Still another is for adaptation to some specific purpose, such as canning, preserving, or other processing.

These modern plant breeders are not satisfied with selecting good types, getting them to breed true, and using them to replace the old ones. Rather, they formulate in their minds an ideal and proceed actually to create something that meets this ideal as nearly as possible by combining the genes -- the units which transmit heritable characters from generation to generation -- from two or more organisms. Their ambition does not stop at getting an organism with a single desirable trait. They strive for many desirable traits in one organism -- for example, high yield, high quality, and resistance to several kinds of disease. A brief summary of what has been done with two products selected at random -- tomatoes and strawberries -- will illustrate the general nature of this work.

Having in mind a definite kind of tomato, the breeder canvasses the world for plants possessing as many of the desired characters as possible. With those he selects he makes a number of crosses -- pollinating one with pollen from another. He may cross a variety that bears well but lacks resistance to disease with a poor yielder of no economic value, which, however, has a strong constitution. He saves the seeds from the fruits of these crosses and plants them in the greenhouse, later setting out the seedling plants in a field, where they complete their growth under ordinary cultural conditions. The breeder watches every one of the new plants carefully, selecting those that seem to have the desired combination of characters. Often these selections are back crossed -- crossed with one of the parent varieties -- to give a larger proportion of one particular parental heritage in the progeny. The seeds from the fruit borne by the back crosses are saved and planted in the same way as the first crosses. The selections from the back crosses may be further backcrossed or they may be "selfed" -- pollinated with their own pollen -- in order to fix the type. Out of the thousands of plants grown from the seed resulting from the selfing, only a few are saved for final tests as possibilities for the commercial grower. At least 12 to 15 generations must be raised to develop a new variety and introduce it to growers.

Department plant breeders used this procedure in developing the Marglobe, the most important tomato variety in the world today. Marglobe is the result of a cross between Globe -- which is resistant to wilt but very susceptible to nail head rust -- and Marvel -- which is highly resistant to both. Marglobe was created just in time to save the Florida tomato shipping industry from virtual extinction through ravages

of wilt and rust. It is a standard variety in many States and an important variety in some foreign countries. Ultimately, perhaps before very long, this tomato will be superseded by still better sorts, for, like all existing varieties, it has its limitations. It cracks rather badly and is not resistant to a number of diseases that are spreading rapidly.

Strawberry breeders, following the same general method as tomato breeders to get their hybrids, have fruited 86,000 strawberry seedlings, representing artificial crosses among 150 different varieties. Of these, 1,999 were selected for further testing. Only eight have finally been considered worth naming and introducing to the trade. Of these some are now widely grown commercially, to the great satisfaction of growers, shippers, canners and consumers. One -- the Blakemore -- is the most extensively grown variety in the United States today.

EXPLORE EFFECT OF HEREDITY ON FARM ANIMALS

Livestock breeders have not advanced nearly so far as plant breeders in applying genetics to the solution of their problems. The Research Center provides facilities for the animal genetics project that lays the foundation for the Department's experiments in animal breeding. The aim of this project is to uncover new principles of farm animal improvement by systems of mating and to test old theories for soundness. Mice are used extensively in this work, because they are well adapted to an artificial life, have numerous and large litters, and are easy to handle.

Dogs do their share in adding to the knowledge that may be applied in attacking some of the more difficult genetics problems, notably those connected with intelligence, disposition, nervousness, and other psychological traits. Because they show so wide a range in intelligence, aptitude, and temperament, and can be handled readily, dogs seem better subjects for studies of this sort than any other animal.

Among the breeds selected to start this research is the Puli dog -- a sheep dog of Hungary. Four of these dogs -- imported in 1935 -- have been crossed with other breeds and their offspring again crossed. The dogs live in light, airy kennels specially built for them, and each receives the ration needed to keep it healthy. All the investigators ask of these dogs is their response to various tests that show the degree of their intelligence, their natural aptitudes, and their dispositions. They are interested in canine psychology, anatomy and physiology. When the dog family at Beltsville grows too large for the accommodations there, the Bureau of Animal Industry culls out those least useful in the research and sells them.

FIND SECRET OF BETTER DAIRY HERDS

The big problem in breeding dairy cows always has been how to reduce the percentage of low milk producers that are born in practically every herd every year. It has been estimated that only one-third of the country's dairy cows return a profit, one-third break even, and one-third fail to pay for their keep.

Records of the production of cows in the Beltsville dairy herd, kept for 22 years, have proved the theory advanced by Department dairy scientists that a bull whose daughters are consistently better milk producers than their mothers is relatively pure in his genetic make-up for the factors that insure high levels of milk production. The use for several generations of bulls whose daughters have proved their sires' worth as transmittors of the factors for high milk production would gradually build up these factors, replacing those for low production, now common in American dairy herds.

DEVELOP NEW STYLES IN SWINE

Styles in hogs have varied widely through the years -- from short, fat types to larger, longer narrower hogs. Just now the style trend is toward a medium type that gains as economically as the larger type hog, but produces the medium-size cuts of meat favored by today's markets. Buyers like hams of from 10 to 14 pounds and bacon with plenty of lean. Swine breeders try to develop such types, and also those that will butcher well both for the lean hams and loins and for a good proportion of bacon.

In their efforts to develop these new animal types, breeders resort to inbreeding as well as to cross breeding. Inbreeding animals is something like racing an automobile at 135 miles an hour. Neither is safe for the layman, but both uncover defects and merits not obvious otherwise. In experimental work with swine, the fear of doing something the farmer can not afford to do or of producing unacceptable pigs has been a drag to progress in breeding better stock. The Beltsville scientists are not handicapped by such fears.

DEVELOP NEW TYPES OF COMMON FARM ANIMALS

Genetics also has paved the way for development of more profitable sheep, goats, horses, and cattle, both beef and dual-purpose. Progress has been made in rearing fur-bearing sheep for this country by crossing Karakul sheep imported from Asia with various American breeds.

PROVE "THREE-P" PROGRAM FOR POULTRY BREEDING

The most successful way to select good poultry stock for breeding is to follow the "three-P" program -- production records, pedigrees, and progeny testing. The progeny test, however, is the real test in determining breeding worth in poultry. Research at Beltsville is showing that it is the concealed heredity of a bird that counts in securing increased egg production, large and hatchable eggs, and low mortality in chicks and adults.

Progeny selection and breeding have resulted in marked improvement in the weight of eggs laid by single-comb White Leghorn pullets. The roosters used in breeding this new line of heavy egg producers were selected on the basis of the average weight of the eggs laid by their sisters and their daughters.

Hens of another newly-developed line lay eggs with a high percentage of thick whites. This ability to lay eggs with thick white, the breeders find, is an inherited characteristic. Consumers like eggs with thick whites for certain purposes, such as poaching, as the whites stand up well around the yolks. These eggs have the further advantage of storing well. Their whites do not become thin and watery as soon as those of other eggs.

SEEK SMALL-TYPE TURKEYS

With the shrinkage of the American family -- and its oven -- comes a growing demand for smaller turkeys. Poultry breeders at Beltsville are developing a small type turkey, white in color, with a compact body, short legs, a long keel bone, and plenty of breast meat. They seek a turkey that will mature in 25 to 26 weeks and will lay plenty of fertile eggs. To this end, they are combining several strains, each capable of contributing one or more of the characteristics desired. White Austrian turkeys from Scotland are a principal reliance for small size and whiteness. White Holland turkeys reinforce the whiteness. Native wild turkeys exert an influence for smallness and are expected to contribute the meaty breast that furnishes a large proportion of choice white meat. White Holland, Bronze, and Black turkey strains help impart the tendency toward early maturity. Although the best individuals in the Research Center's flock now approach the ideal for the new turkey, intensive breeding and rigid culling for several more years will be necessary to establish the new type so that it will breed true.

FIND BETTER WAYS TO PRODUCE AND USE CROPS

Side by side with the breeding research designed to give the United States better fruits, vegetables, livestock, and poultry go a vast number of studies designed to bring to light facts that will point the way to better methods of raising and caring for all these crops, of keeping them free from disease, infections, and infestations, and of getting them to market most effectively and efficiently, as well as to new uses for them.

The cause and cure of diseases of apples, pears, peaches, grapes, potatoes, sweetpotatoes, beans, peas, cucumbers, and tomatoes receive particular attention. Beltsville pathologists have identified among many other things, a new mosaic disease of tomatoes and have drawn up recommendations for a way to cut down losses from it in greenhouses where tomatoes are grown.

There is tremendous room for improvement in the propagation and cultivation of fruits and vegetables. Another line of investigation at Beltsville shows that some of the finest-quality grape varieties, which grow rather poorly on their own rootstocks, double in vigor and productiveness when grafted on vigorous rootstocks of other grapes.

Canners always want the best variety of a fruit or a vegetable for preserving by canning or by making into preserves, jellies, or juice. Scientists at Beltsville have contributed much valuable information on this and are fast collecting more.

Cold storage investigations, for which special equipment has been installed, have brought many results of value to the industry. For one thing, it has been demonstrated that the eating and canning quality of the Kiefer pear -- grown largely in southeastern United States and in much less demand than formerly -- can be greatly improved by keeping the fruit at certain temperatures.

LEARN HOW TO FEED FARM ANIMALS

Quite as fundamental as the research on animal breeding is that which seeks to uncover the principles underlying animal nutrition. Laboratories at Beltsville are equipped for intensive physiological and biological studies on animals to answer such questions as: How do various kinds of feed affect the characteristics of fat deposited in animals? How much protein in feed is necessary for maintenance, growth, and reproduction? How important is the mineral content of a ration? What is the relation between the quality and the palatability of a ration and the changes in composition and color of the meat of the animal receiving it?

The ultimate measure of the success of various systems of livestock production is the quality and quantity of meat produced. Detailed laboratory, cooking, and palatability studies are made on the meat from the experimental animals slaughtered in the experimental abattoir. These observations include physical and chemical analyses, color reading, histological examinations, and mechanical tests for tenderness, as well as cooking tests and palatability judging and grading by experts.

Experiments with different methods of trimming, handling, and preserving meat under farm conditions are conducted also.

Other problems under consideration by meat investigators at Beltsville are the causes of dark-cutting beef, the relative palatability of grass-fattened and grain-fattened beef, and the relation of age, sex, breeding, and feed to the quality and palatability of meat.

SEEK CURES FOR LIVESTOCK DISEASE

Research projects in animal diseases usually extend over a period of years, and the importance and practical application of the results may not become apparent until another period of years has elapsed. Bang's disease -- a serious cattle ailment -- has received major attention. These studies have given negative, as well as positive results. They have shown that no medicinal materials now known can cure the disease, but that vaccinating calves may prove a preventive. Some of the facts discovered in the course of this investigation are a great aid in detecting infected animals.

Studies on the differentiation of foot-and-mouth disease from much less serious cattle diseases that may be confused with it have provided information that aids in prompt and correct diagnosis.

Zoologists and parasitologists study the vast number of parasites that attack livestock and develop medicinal treatments and control measures to protect domestic animals and poultry from such parasites. The most recent contributions from this branch of the service are the development of the phenothiazine treatment for removal of many of the most injurious worms that infest horses, cattle, sheep, and swine, and of barium antimony tartrate for the removal of gapeworms in poultry.

SEEK NEW WAYS TO CONTROL INSECT PESTS

Consumers' dislike of fruits and vegetables showing holes, stings, or other evidence of insect activity calls for widespread use of insecticides on American farms. When the reaction against produce with a worm hole or two in it first set in, farmers relied mainly on lead and arsenic for control of fruit and vegetable insect pests, especially the codling moth, No. 1 insect enemy of the apple. Before long, however, it was discovered that spray residues of lead and arsenic, though too small to be harmful in themselves, might add up to a dangerous dose of poison. The human system does not give off these substances completely, but stores them little by little. Public health laws now ban the marketing of fruits and vegetables that contain more than the merest trace of harmful spray residues.

To keep within the law, then, growers must either remove certain spray residues, by washing or some other process, or else abandon the use of the insecticides that leave them. Treating fruits and vegetables to remove spray residues makes more work for the grower and runs up production costs. No entirely satisfactory substitute for lead arsenate as a control for the codling moth and several other economic insect pests has yet been found. One objective of chemists and entomologists is to find new preparations that are toxic to insect pests, but harmless to the vegetation on which they will be applied, as well as to people who eat the products treated with them. Furthermore, these insecticides must be so cheap and so easy to use that they are practical for the average grower.

Another group of insect pests, including flies and mosquitoes, no longer are accepted as a necessary evil. Modern methods of spraying, dusting, and fumigating go far toward wiping out these menaces to human happiness and health. A second objective of chemists and entomologists is the improvement of these methods and the formulation of new ones.

Another pressing need in the nation's never-ending war on the 10,000 kinds of insects that inflict an annual damage estimated at half a billion dollars is for measures that can be counted on to protect from insect attack ornamentals and other plants grown under glass, and also mushrooms. A third objective of Beltsville entomologists is the discovery of materials and the development of technic that will be effective in greenhouses, in fields and gardens, and in mushroom houses against the myriads of mites, aphids, thrips, and plant lice that now seriously interfere with the successful operation of several expanding American industries.

CHEMISTS START THE SEARCH

The search for new insecticidal materials starts in the chemical laboratories. Because inorganic substances, such as lead and arsenic, are cumulative poisons, the chemists consider mostly organic substances, such as nicotine, rotenone, and the pyrethrins, which are not cumulative poisons.

Nicotine, obtained from tobacco, has long been known as a good contact insecticide -- one that kills as it hits soft-bodied insects, such as aphids, that get their food by sucking juices out from plant tissues. Because they are soluble in water, nicotine and nicotine sulphate wash off too soon to be good stomach insecticides -- those that must be swallowed by insects, like the codling moth worm, that get their food by chewing plant surfaces. Beltsville chemists are trying to find a fixative that will keep nicotine in place long enough to be effective as a stomach insecticide.

The pyrethrins are the insecticidal principles of pyrethrum, a species of Chrysanthemum that grows in the Far East, where its flowers have long been known to be toxic to insects. Rotenone is the main insecticidal constituent of derris, the roots of which Chinese market gardeners in the Malay peninsula have used for countless centuries to kill insects attacking their crops, and of cube, which grows in South America.

For the last 12 years, Beltsville chemists have been working to extend the use in the United States of insecticidal preparations made from pyrethrum, derris, and cube. Pyrethrum dusts are now widely used for controlling cabbage worms and many other insect pests. Pyrethrum extracts are used to make household fly sprays and sprays to protect livestock from flies and other insects. As much as 20,000,000 pounds of pyrethrum flowers has been imported in one year from Japan, Kenya Colony, and other countries. Rotenone preparations are effective against a number of insect pests, including the Mexican bean beetle and the pea aphid. In 1939, more than 5 million pounds of rotenone-containing roots were imported into this country.

Beltsville chemists were the first to determine the correct constitution of rotenone. They have also synthesized entirely new organic compounds, some of which, entomological tests show, have high insecticidal value. Suitable synthetic substitutes for the imported pyrethrum, derris and cube, that could be manufactured here, would be of great value when war interferes with shipping.

ENTOMOLOGISTS RUN TESTS ON INSECTS

Materials whose chemical structure indicates they may make good insecticides go to the entomologists for testing on insects under controlled laboratory conditions. Only about a dozen out of every thousand of these materials pass the preliminary entomological tests. Those proceed to field stations of the Bureau of Entomology and Plant Quarantine for larger-scale tests under conditions that prevail in fields and orchards. Years of research and tests lie back of every new commercial insecticide that appears on the market.

Codling moths, army worms, silk worms, houseflies, and other insects are to the entomologist what guinea pigs, rabbits, and white mice are to the biologist. Great numbers of these insects are reared in cages and greenhouses at Beltsville. They are put through a number of ingenious tests to prove, or disprove, the power of new ways to destroy them.

Sometimes the experimental insects are induced to nibble on a poison sandwich -- two bits of green leaf with a filling of insecticide. Again, they are turned loose in a test-tube orchard -- glass vials, with an apple plug in the top of each one, arranged in rows in a wooden rack -- which has been sprayed with test material. The fate of the insects eating the doctored food set before them shows whether or not the material used merits further consideration as a stomach insecticide.

Different technic is required for testing contact insecticides. One apparatus for such tests consists of several large aluminum drums mounted on a turn table. The test material, in measured quantities, is sprayed into the top of each drum; a hundred or more healthy houseflies, in a shallow glass cage topped with wire screening, are placed in the bottom of each drum. The count on the flies that survive and succumb after treatment in the drum tells how effective the material used may be as a contact insecticide.

Conditions under which greenhouse and ornamental plants and mushrooms are grown commercially are duplicated in the greenhouses and mushroom house at Beltsville. Here entomologists, aided by engineers, have developed treatments now generally adopted by the industries concerned in combatting the insects that infest their products. These include hot-water treatments for cyclamens, delphiniums, gerbers, and chrysanthemums, fumigation of roses and carnations with cyanide, nicotine, and methyl bromide, and burning sulphur in mushroom houses and, later, dusting mushroom beds with pyrethrum powder.

RUN AN INSECT CLINIC

Perhaps the most basic of all the fundamental entomological research is the study on insect anatomy and physiology. It was started to provide much needed information on how the heart, blood, digestive tract, and other organs and tissues of insects function normally and how they respond to changes in temperature and other environmental conditions, as well as to different diets. To make the physical examinations and autopsies on insects needed to give the desired records, the Bureau of Entomology and Plant Quarantine has set up a sort of insect clinic, where death and destruction, rather than life and health, are the objectives.

Army worms, cockroaches, and other experimental insects destined for a trip to the clinic are reared in the laboratory or greenhouse, under favorable temperatures and other conditions and on food best suited to them. Some insects from a lot selected for a special study are allowed to continue this ideal life. Others are put on rations containing nicotine, pyrethrum, rotenone, or other insect poison in varying quantities.

At intervals these experimental insects are taken to the clinic, anesthetized, and dissected -- a very delicate operation, calling for special instruments -- miniature replicas of the knives, scalpels, scissors, and other instruments used by surgeons on human beings. The records thus obtained give an accurate picture of each important insect organ or tissue as it functions normally and when brought in contact with an insecticidal material.

To ascertain the effect of various insecticidal materials on the insect heart, the entomologists have devised a photographic method that has given them hundreds of valuable records. The beating of the insect heart, kept alive in salt solution, is actually photographed, providing "mechanocardiograms" that are true pictures of heart beats under different kinds of stimulation.

INVESTIGATE COMMERCIAL INSECTICIDES

At another laboratory -- that run by the Agricultural Marketing Service -- samples of commercial insecticides, germicides, and disinfectants are tested to determine whether or not they are safe to use according to the directions with them and can do what their labels say they can do. If not, their interstate shipment is illegal under the terms of the Insecticide Act, and officials of the Agricultural Marketing Service which enforces the act, immediately take steps to have the products removed from the channels of trade, until the labels have been amended to tell the truth or the preparations have been changed to meet the label statements.

BREED NEW STRAINS OF HONEYBEES

Although injurious insects hold the center of the entomological stage at Beltsville, one beneficial insect -- the honeybee -- has an important place there too. There are in the world today many varieties and strains of bees, each differing from the others in usefulness and in ability to resist disease. Apiculturists are trying to breed strains of bees that will excel as honey makers and also will have an inborn resistance to American foulbrood, a fatal bee infection that annually destroys thousands of colonies. As bees refuse to breed in captivity, the controlled breeding necessary to produce the new strains sought must be done artificially.

Several of the new strains of bees show marked resistance to the organisms of American foulbrood. Others have unusually long tongues, the better to reach the nectar in long-necked flowers.

Under the Honeybee Inspection Act of 1922, adult honeybees can be brought into the United States from foreign countries only after rigid inspection shows they are free from disease. This inspection is done at Beltsville.

IMPROVE GRAIN STANDARDS

Standardization and inspection of farm products -- fundamental to efficient marketing and distribution -- are among the principal functions of the Agricultural Marketing Service. Standards have been established for most farm products. Some of these, including those for grain, are mandatory if the products are sold by grade and are shipped in interstate or foreign commerce.

Before the formulation of Federal standards, about 25 years ago, grain marketing was in a chaotic condition, with a great variety of local standards and no uniformity in their application. Federal grain standards now provide the medium of a common understandable language between buyers and sellers. Official inspection gives an unbiased appraisal of the quality of grain, independent of either buyer or seller.

To supply background information for the inspection of both grain and rice, the Grain Standards Research Laboratory performs mechanical, chemical, and milling and baking tests on samples of grain found in commerce, with the view not only of improving the structure of the standards to meet changing conditions but also of working out new and improved methods of evaluation, which can be translated into terms of practical inspection service.

Research now under way includes testing of electric moisture meters which indicate accurately the moisture content of grain in much shorter time than the old distillation method; development of a way to determine the degree of soundness in grain which has deteriorated to some extent; methods for determining incipient and progressive damage in stored corn; rapid tests for determining the quantity and quality of oil in flaxseed and soybeans; methods of evaluating barley that has premium value for malting; and the milling of wheat and baking of flour to evaluate its properties.

Of major importance has been the development and standardization of mechanical equipment for use in grain-inspection work to eliminate the personal element. This equipment includes a divider that cuts down large samples into aliquot portions for analysis; an improved test weight per bushel apparatus; standard dockage machines for cleaning grain; and seiving apparatus for kernel-sizing tests.

INSURE SEED QUALITY

Because seeds look more or less alike to the layman, farmers need some assurance that those they buy will produce the kind of plants they have a right to expect from reading the label or advertising statements and that they will germinate. To provide this assurance, Congress passed the new Federal Seed Act in 1939. This act, enforced by the Agricultural Marketing Service, requires complete and truthful labeling of seed shipped in interstate commerce for seeding purposes and prohibits false advertising. It prohibits also the importation of seed that fails to meet certain standards of quality.

To make sure that seedsmen are complying with the law, the Agricultural Marketing Service each year examines hundreds of samples of seed taken from interstate channels of trade by State inspectors under State seed laws. These seeds are tested at the Federal Seed Testing Laboratory at Beltsville and, under the supervision of that laboratory, at field laboratories in California, Missouri, Indiana, Alabama, Oregon, and North Dakota.

Germination tests on these samples reveal the viability, or lack of viability, of seeds in each shipment. The tests are made by placing a certain number of the seeds on moist blotting paper and letting them remain for several hours in a cabinet kept at the temperature best suited for the germination of that particular kind of seed.

The trained botanists in the Beltsville laboratory usually can identify a seed after careful scrutiny through the microscope. Sometimes, however, they run onto a variety they cannot distinguish from other varieties. For an accurate determination of their variety these seeds must be planted and allowed to grow. Until recently such planting was done out of doors, which meant a wait of several months for the plant to reach a stage where it could be identified. Now ways are being perfected for growing the seeds in the greenhouse, which takes as a rule only four or five days, or at the most a couple of months.

New methods for testing seeds and ways to improve old ones call for constant research. The primary problem of this sort now under consideration is the development of effective methods for determining the germination powers of the newer grasses being introduced by the Department's forage crop specialists to renew pastures and ranges that have suffered from the drought and from overgrazing. Another important problem receiving attention is the development of technic that will ensure uniform results in testing seeds throughout the United States.

In addition to its strictly law-enforcement activities, the Agricultural Marketing Service provides a special service for buyers of alfalfa and red clover. There are so many varieties of these crops, each specially adapted to certain growing conditions, that the buyer needs information that will permit him to select seed produced in an environment the same as, or similar to, the one where it is to be planted. Seeds of alfalfa and red clover are verified as to origin at the Federal Seed Testing Laboratory at Beltsville and, under that laboratory's supervision, at field laboratories in Columbia, Mo., Chicago, Ill., and Minneapolis, Minn. The Federal seed officials issue certificates of such verification of origin to seedsmen.

Another extra service provided by the seed testing laboratories, both at Beltsville and in the field, is the dockage service for buyers and sellers of country-run seed of timothy and sweet clover. This service determines how much weed seed and other foreign material usually removed by cleaning remains in the seed.

SEEK BETTER WAYS TO UTILIZE FARM PRODUCTS

The Bureau of Home Economics, in its laboratories at Beltsville, looks for ways to use agricultural products that will most benefit consumers.

Nutritionists study adequate diets for human beings. Present research in this field -- focused on the vitamins, particularly vitamin A and the B-complex -- is of two types. One problem is to find out how much of each vitamin a human being needs. The other is to assay common foods and find rich and economical sources of each vitamin. A study made with volunteer subjects showed that the average normal adult's vitamin A requirement is about 4,000 international units a day. A continuation of this study is revealing how much vitamin A a person can store in his body and how long he can store it.

Often a link between research in other lines of investigation by the Department and the ultimate consumer is the food utilization research under way in the Beltsville laboratories. In the experimental kitchens, scientific cooks test for eating quality beef roasts produced by the animal husbandmen, turkeys bred and fed by the poultry husbandmen, potatoes improved by the horticulturists. "Taste" and other tests of eating quality tell these cooks whether the new product has the qualities consumers want. This information offers farmers a guide in growing the kinds of food consumers want to buy.

Worked out also in the experimental kitchens are successful methods of food preservation and preparation. These include canning, jelly making, cooking meat at moderate heat, and cooking to conserve food values. Much of this work ties in with the Department's effort to move farm surpluses into consumer channels. Recipes using surplus foods have been prepared for use in schools that serve lunches. Low-cost family-size recipes for eggs, prunes, and other food on the surplus list also have been worked out.

At the request of Congress, textile specialists at Beltsville are looking for ways to promote the use of the abundant cotton crop. Already they have designed better-looking, better-wearing, better-fitting cotton stockings. More than 80 designs for full-fashioned cotton hose have been made up in the laboratory and released to the trade. A number of these designs have been adopted commercially. As wear studies and laboratory tests show ways in which these stockings may be improved, the textile specialists will develop new designs.

On the permanent research program are the analysis of fabrics and the serviceability and other tests to supply information consumers may use in getting what most suits their needs and their pocketbooks. From the results of this work, the Bureau has published buying guides for sheets, blankets, pillowcases, women's hosiery, women's coats, dresses, and slips, and men's cotton shirts. Also it has drawn up specifications for cotton and wool goods which are of use to manufacturers in improving quality and wearability of clothing and household textiles.

The Army, the Navy, and the Marine Corps are using the results of another piece of research in the textile laboratories which produced an effective method of mildew-proofing cotton fabrics. This method provides a means of preventing damage to tents, tarpaulins, and sandbags.

A way to sterilize wool without damaging the fibers came out of another laboratory -- a process valuable in sterilizing hospital blankets, and perhaps army uniforms, to prevent the spread of disease. A public service patent has been granted to the scientists who discovered it.

Homemakers want to know how to buy and how to operate electric irons, vacuum cleaners, stoves, refrigerators, and many other pieces of household equipment. To find the right answers to their questions, home economists test the performance of the various types of equipment on the market.

STUDY "HILLCULTURE"

Farmers everywhere lose fertile soil with every hard rain. Soil erosion, already has ruined nearly 100 million acres of once-productive crop land in the United States. It costs the American public -- both farmers and city people -- not less than $3,800,000,000 a year.

On a 1700-acre tract on the south side of the Research Center, the Soil Conservation Service is developing new and more effective ways of meeting this problem. Here it deals mainly with plants that show special promise for erosion control.

Trees, shrubs, and grasses are the most effective weapons that man has been able to find to combat soil erosion. But these dense-growing, soil-binding types of vegetation vary widely in soil requirements, growth habits, and economic value. On its tract at Beltsville, the Soil Conservation Service is trying to single out those strains and varieties that make the best growth on poor and eroded soils and at the same time bring in the best income for the farmer.

Under observation here are trees that produce high-quality wood for furniture, poles, and posts; shrubs that bear fruit for home-made jellies, jams, and wines; grasses that make succulent feed for livestock. The Soil Conservation Service is learning how they grow, where they grow best, and what kind of treatments they need. This conservation research is called "hillculture" because it is designed essentially to disclose safe and profitable ways of farming steep, erodible lands.

DEVELOP 1900-ACRE EXPERIMENTAL FOREST

Foresters at Beltsville look for the best way to develop gradually the 1900-acre experimental forest into a good research-demonstration area. They study methods of growing timber crops and investigate some of the more basic forest problems, such as seed and tree physiology and growth and forest soil relations.

The experimental forest consists chiefly of second-growth oak and scrub and loblolly pine that grew after a century of intermittent cutting and burning. Thus it will illustrate the use of inherently poor soil and abused woodland for forest production. As some of the trees, such as scrub pine, are of relatively low value, the foresters will study the possibilities of encouraging more valuable trees, like tulip poplar, and of producing faster growth of the higher-quality trees. Cultural measures to improve the form and quality of the poorer tree species include control of density of trees to the acre, growing desirable mixtures of hardwoods and pines, and pruning lower branches to increase timber quality.

Among the basic forest problems under investigation are technic for handling seed for nurseries, for transplanting young plants under field or woods conditions, and for collecting, storing, and germinating seed, particularly that of certain little-known species used in field windbreaks or shelterbelts. Some of these have given nurserymen serious trouble. Cottonwood, for instance, refuses to grow unless floated in water onto the nursery beds, and other seeds fail to germinate unless kept in cold storage after gathering.

The Beltsville foresters also study root growth and behavior with a view to lowering costs of reforestation and increasing the survival of young trees. Their studies on the use of various growth substances, such as vitamin B_1 or thiamin, are designed to lessen planting difficulties in reforesting waste or low-value lands.

STORE AERIAL PHOTOGRAPHIC FILM

The Agricultural Adjustment Administration carries on no research work at Beltsville, but attaches importance to the center because of space made available for storage of aerial photographic film, used in making the aerial pictures which play an important role in administering the farm program.

More than 15,000 rolls of aerial photographic film, each more than 100 feet long and representing altogether pictures of more than three million square miles of land area, are stored in fireproof, air-conditioned vaults. These negatives, whose total value is three to four million dollars, are brought to Department laboratories in Washington, D. C., for use as needed, then returned to vaults in Beltsville for filing and safe keeping.

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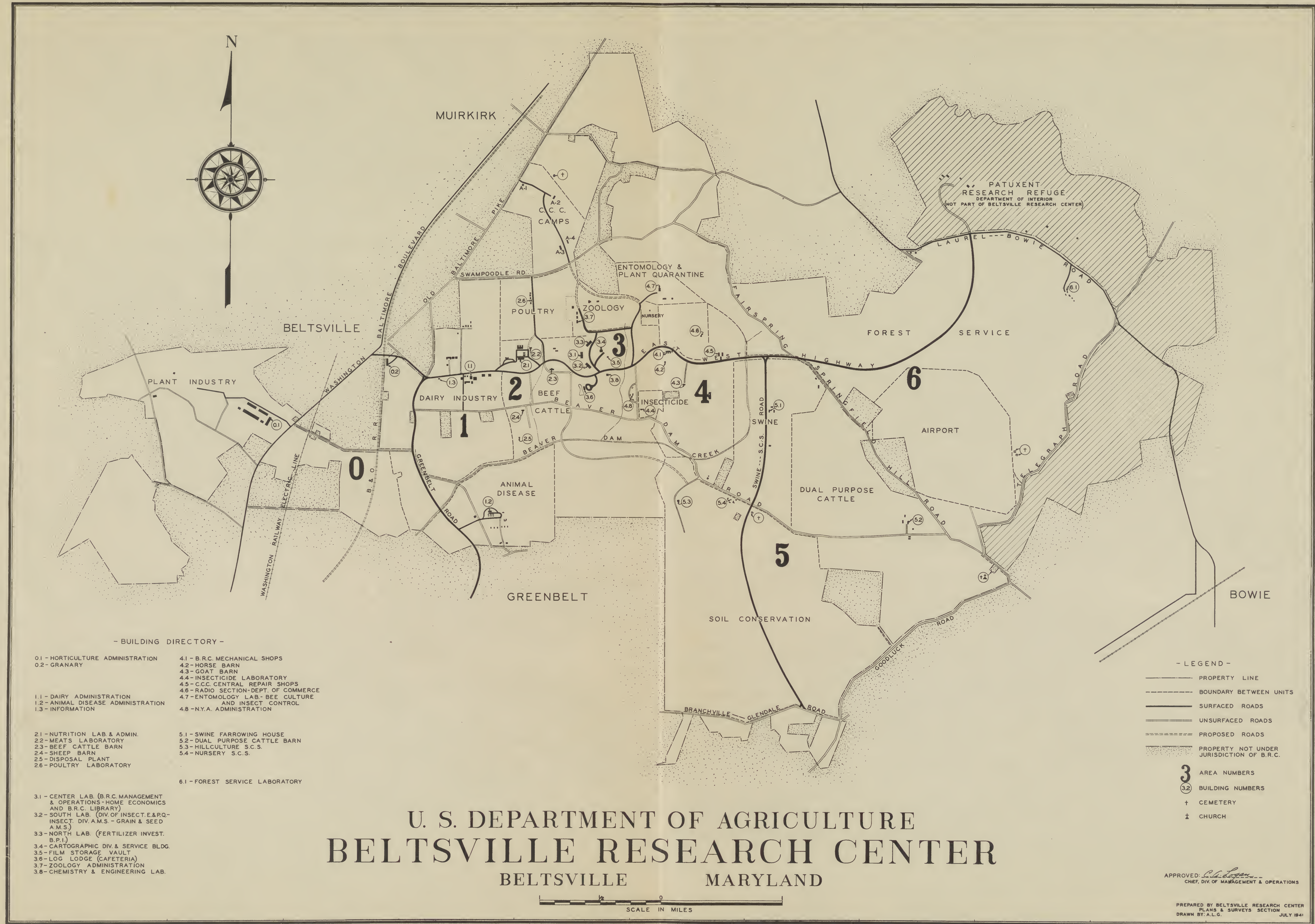
April 1, 1941.



- BUILDING DIRECTORY -

0.1 - HORTICULTURE ADMINISTRATION
0.2 - GRANARY

1.1 - DAIRY ADMINISTRATION
1.2 - ANIMAL DISEASE ADMINISTRATION
1.3 - INFORMATION

2.1 - NUTRITION LAB. & ADMIN.
2.2 - MEATS LABORATORY
2.3 - BEEF CATTLE BARN
2.4 - SHEEP BARN
2.5 - DISPOSAL PLANT
2.6 - POULTRY LABORATORY

3.1 - CENTER LAB. (B.R.C. MANAGEMENT & OPERATIONS - HOME ECONOMICS AND B.R.C. LIBRARY)
3.2 - SOUTH LAB. (DIV. OF INSECT. E.&P.Q. - INSECT. DIV. A.M.S. - GRAIN & SEED A.M.S.)
3.3 - NORTH LAB. (FERTILIZER INVEST. B.P.I.)
3.4 - CARTOGRAPHIC DIV. & SERVICE BLDG.
3.5 - FILM STORAGE VAULT
3.6 - LOG LODGE (CAFETERIA)
3.7 - ZOOLOGY ADMINISTRATION
3.8 - CHEMISTRY & ENGINEERING LAB.

4.1 - B.R.C. MECHANICAL SHOPS
4.2 - HORSE BARN
4.3 - GOAT BARN
4.4 - INSECTICIDE LABORATORY
4.5 - C.C.C. CENTRAL REPAIR SHOPS
4.6 - RADIO SECTION - DEPT. OF COMMERCE
4.7 - ENTOMOLOGY LAB. - BEE CULTURE AND INSECT CONTROL
4.8 - N.Y.A. ADMINISTRATION

5.1 - SWINE FARROWING HOUSE
5.2 - DUAL PURPOSE CATTLE BARN
5.3 - HILLCULTURE S.C.S.
5.4 - NURSERY S.C.S.

6.1 - FOREST SERVICE LABORATORY

U. S. DEPARTMENT OF AGRICULTURE
BELTSVILLE RESEARCH CENTER
BELTSVILLE MARYLAND

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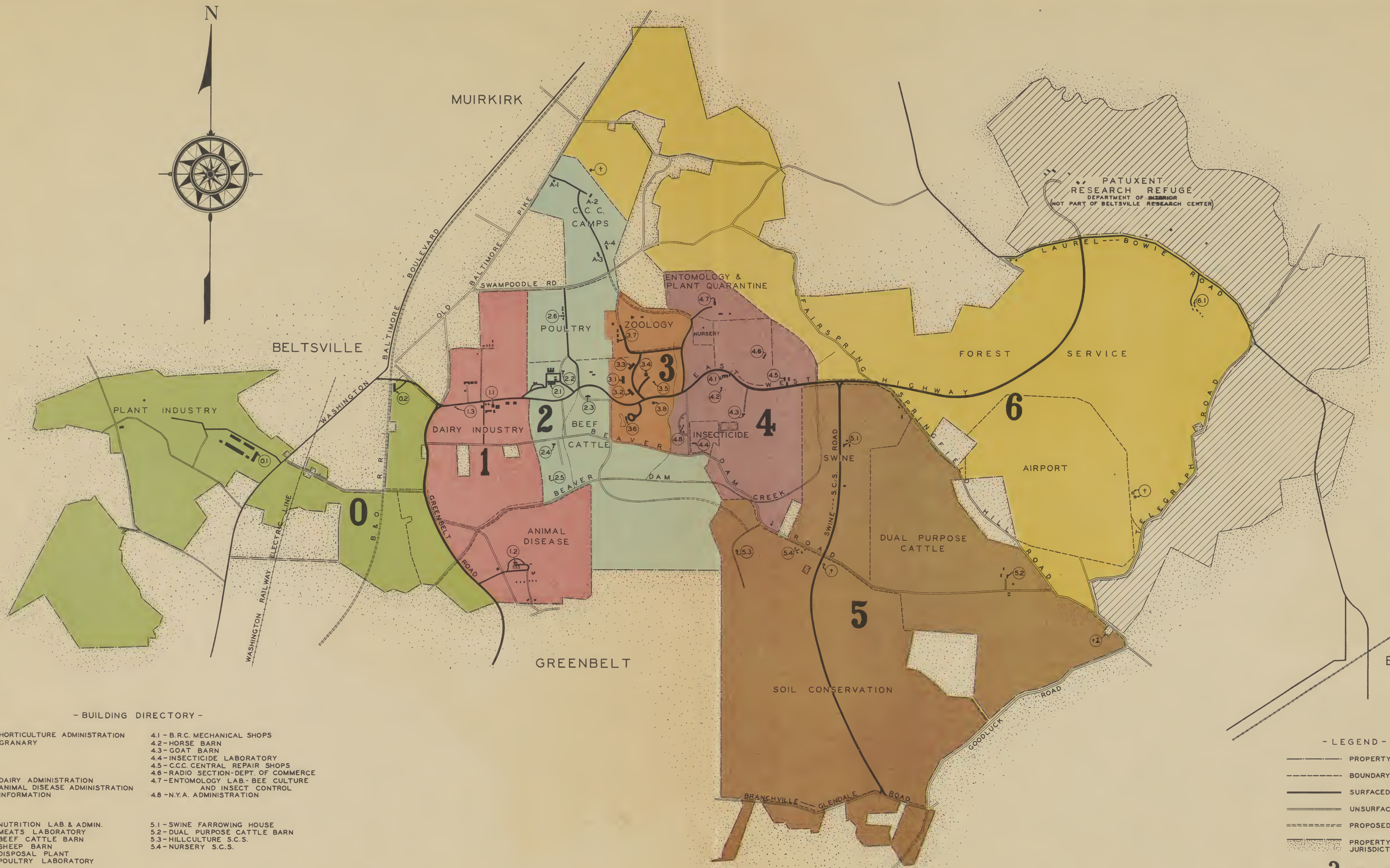
SCALE IN MILES

- LEGEND -

PROPERTY LINE
BOUNDARY BETWEEN UNITS
SURFACED ROADS
UNSURFACED ROADS
PROPOSED ROADS
PROPERTY NOT UNDER JURISDICTION OF B.R.C.
3 AREA NUMBERS
3.2 BUILDING NUMBERS
† CEMETERY
‡ CHURCH

APPROVED: C. A. Logan
CHIEF, DIV. OF MANAGEMENT & OPERATIONS

PREPARED BY BELTSVILLE RESEARCH CENTER
PLANS & SURVEYS SECTION
DRAWN BY: A.L.G. JULY 1941



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